UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/768,051	01/24/2001	Paul David Gootherts	10004801-1	2287

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EXAMINER
NGUYEN, ANH T

ART UNIT	PAPER NUMBER
2174	

DATE MAILED: 06/16/2004

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Please find below and/or attached an Office communication concerning this application or proceeding.

		Application No.	Applicant(s)
Office Action Summary		09/768,051	GOOTHERTS, PAUL DAVID
		Examiner	Art Unit
		Anh T Nguyen	2174

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>2</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>30 March 2004</u>.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1.   This final action is responsive to paper number 3, Amendment A, filed 3/30/04.

Claims 1-19 are pending in this application. Claims 1, 8, 12, and 13 are independent.

In Amendment A, claim 8 was amended, claim 9 was cancelled, and claims 14-19 were added.

The rejections of claims 3 and 7 under 35 U.S.C. 112, second paragraph, as being indefinite is

withdrawn.

This action is Final.

Claim Rejections - 35 USC § 102

2.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3.   Claims 1, 3, 5-10, 12-13, and 15-16, and 18-19 are rejected under 35 U.S.C. 102(e) as

being anticipated by Brenner et al., USPN 6,658,449 (hereinafter Brenner).

As per claim 1, Brenner teaches the invention as claimed including a computer

implemented method of load balancing comprising the following steps:

determining the state of each of two or more processors, wherein the state includes at

least one of a source (i.e. at least one starving thread) and sink (i.e. no starving threads) state

(FIG. 5, col.7, lines 14-19); and

if at least one of the two or more processors(abstract, line 8) is in a source state and at least one of the two or more processors is in a sink state, transferring at least one thread from a queue of a source state processor to a queue of a sink state processor(col.1, lines 62-65, *shifting threads from heaviest loaded to lightest loaded*).

As per claims 3 and 5, Brenner teaches wherein the method further comprises repeating said steps (FIG.5, col.7, lines 9-13, *load balancing is done periodically*) (or repeatedly).

As per claim 6, Brenner teaches the method as claimed in claim 1, wherein the method further includes the following step:

determining the load of each of the two or more processors (col.12, lines 30-31).

As per claim 7, Brenner teaches the method as claimed in claim 6, wherein the transferring step further includes:

transferring at least one thread from the highest loaded, source state processor to the lowest loaded, sink state processor (col.12, lines 66-67, col.13, lines 1-2).

As per claim 8, Brenner teaches a computer implemented method of load balancing a multiprocessor computer system, comprising the following steps:

determining a score (i.e. load factor) of each of two or more processors (col.7,lines 15-16, lines 28-29);

determining a best score (lowest load) processor and a worst score processor (highest load) (col.7,lines 15-16, lines 28-29); and

transferring at least one thread from a queue of a worst score processor to a queue of a

best score processor (col.12, lines 66-67, col.13, lines 1-2)..

As per claim 9, Brenner teaches the method as claimed in claim 8, wherein the score is a

function of at least a processor state (FIG.10, step 1040).

As per claim 10, Brenner teaches the method as claimed in claim 8, wherein the score is a

function of at least a processor state and a processor load (FIG.10, step 1040).

Claim 12 is directed to a method of claim 1 with respect to a networked plurality of

computer systems (FIG.1). Therefore, it is rejected for the same reasons as claim 1 set forth

hereinabove.

As per claim 13, it is a system claim of claim1. Therefore, it is rejected for the same

reasons as claim 1 set forth hereinabove.

In addition, Brenner teaches one or more processors for receiving and transmitting data

(FIG.1, col. 9, lines 18-19) and a memory coupled to said one or more processors, said memory

having stored therein sequences of instructions which (col.5, lines 53-55).

Claim 15 is similar in scope to claim 6 and therefore is rejected under similar rationale.

Claim 16 is similar in scope to claim 7 and therefore is rejected under similar rationale.

Claim 18 similar in scope to claim 15 and therefore is rejected under similar rationale.

Claim 19 is similar in scope to claim 16 and therefore is rejected under similar rationale.

Claim Rejections - 35 USC § 103

4.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5.   Claims 2, 4, 11, 14, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brenner et al., USPN 6,658,449 (hereinafter Brenner).

As per claim 2, 14, and 17, Brenner teaches the method as claimed in claim 1. Brenner does not explicitly teach wherein the state further includes a neither state. However, one of ordinary skill in the art would recognize that a neither states exists where the processor is not currently starving any threads, but if one or more threads were added, the added threads would start to starve immediately.

As per claim 4, Brenner does not explicitly teach wherein the method is initiated once every second. However, Brenner does teach periodic load balancing is performed every N clock cycles (col.7, line 9). One of ordinary skill in the art would recognize the need to perform load balancing periodically, including once every second, to avoid starvation.

As per claim 11, Brenner teaches the method as claimed in claim 10. Brenner does not explicitly teach wherein the processor state is weighted more heavily than the processor load. However, one of ordinary skill in the art would have recognized that the weight of the processor state is essential in determining execution failure of threads (i.e. starvation) in the field of load balancing.

Response to Arguments

6.   Applicant's arguments filed 3/30/04 have been fully considered but they are not persuasive.

As per Claims 1, 3, 5-7, and 12-13, Applicant argues that Brenner fails to disclose determining if a processor is in a sink state and thus, cannot disclose transferring a thread from a source state processor queue to a sink state processor. The examiner disagrees because Brenner does disclose transferring [i.e. shifting] threads from the heaviest loaded [i.e. source state] queue to the lightest loaded queue [i.e. sink state] (col.1 lines 52-65). Brenner discloses determining the state of the processor by scanning the processor's [i.e. nodes] queues periodically to identify the highest [i.e. source] and lowest loaded queues [i.e. sink state] (col.7, lines 9-19).

As per claim 8, Applicant argues that Brenner fails to disclose a processor score being a function of the processor state. The examiner disagrees because Brenner discloses the load factor, which is a function of the number of threads on each run queue on each processor and also defines the processor state. Therefore, if the heaviest loaded [i.e. largest number of threads] processor is in a source state and the lightest loaded [i.e. smallest number of threads] processor is in a sink state, then it must necessarily be that the load factor or processor score is a function of the processor state.

As per claim 2, in response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). Furthermore, during typical load balancing, there will always be an instance where no activities are being imposed on the

processor [i.e. processor is idle]. Since the processor is neither transferring nor receiving any threads, there would not be any threads to be created to cause the processor to be starving or sinking, thus there exists a neither state.

As per claim 11, in response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). During typical load balancing, the load on a processor is determined by the number of threads, which determines the state of the processor. When the processor reaches a state where it is overloaded with threads [i.e. the threads become starved], the processor is considered to be in a source state. The state of the processor is important in determining whether to transfer threads from a heavy load to a lighter load in order to maintain optimal load balancing and ensure execution of threads.

Conclusion

7.   **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this

final action.

Inquiries

8.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Anh Nguyen whose telephone number is **(703) 305-8649**. The

examiner can normally be reached on Monday - Friday from 7:00 am to 4:00 pm (EST).

The fax number for the organization where this application or proceeding is assigned is

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Kristine Kincaid, can be reached on (703) 308-0640.

The fax number for the organization where this application or proceeding is assigned is

(703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding

should be directed to the receptionist whose telephone number is (703) 305-3900.

Anh T Nguyen
Examiner
Art Unit 2174

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